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International Academic Institute for Science and Technology

International Academic Journal of Accounting and Financial Management
Vol. 3, No. 2, 2016, pp. 47-59.

ISSN 2454-2350

International Academic Journal of Accounting and Financial Management

www.iaiest.com

Determinants of Capital Structure: An Application on Manufacturing Firms in Borsa Istanbul

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Abstract

This paper attempts to analyze the significant determinants of capital structure in Turkish manufacturing industry using panel data methodology. This study employs a data set containing annual data from 131 Turkish listed companies in Borsa Istanbul between the years 2005 – 2014 to document their capital structure characteristics. Because of many studies that examine capital structure concentrate on non-financial companies, we choose manufacturing firms as our sample. Since International Financial Reporting Standarts (IFRS) adoption has started in 2005 for Turkish listed firms, the period of 2005-2014 selected for this paper. In this study, seven firm specific determinants are used as independent variables to analyze capital structure of Turkish firms. These are; Firm Size, Profitability, Growth in total asset, Earnings volatility, Tangibility, Non-debt tax shields and Liquidity. According to results, Firm Size and Non-Debt Tax Shield have positive impacts on Turkish Manufacturing Firms' financial leverage as expected. In addition, Profitability and Liquidity variables have negative effects on gearing as mentioned in the literature. However, Tangibility and Growth in total asset variables do not influence the leverage as expected in our hypothesis yet they are still significant. There is an ambiguity for these two variables' effects on leverage in the literature. Lastly Earnings Volatility is the only variable that is insignificant and rejected.

Keywords: Capital Structure, Borsa Istanbul, Leverage, Turkey

Introduction:

Capital structure is a well-documented phenomenon and can be defined as a combination of a debt and equity to finance a firm. Capital structure generally focuses on how firms decide to finance their assets between many sources. There are many theories that guide how a firm's capital structure should be. For instance, Pecking Order theory suggests that firms ought to follow a hierarchy starts from internal sources to debt and finishes with issuing equity. On the other hand, Trade off theory explains capital structure as a balance between various pros and cons of debt and equity. The management of a firm is responsible to make vital decisions about setting capital structure in a way that the firm's value is maximized. Financial distress may be emerged through a wrong decision even it may lead to bankruptcy (Alipour et al., 2015). Even though there is a little consensus about making the optimal capital structure decision for firms, this question mark is one of the deeply researched areas in corporate finance. Modigliani & Miller (1958), Booth et al. (2001), Myers (1977), Rajan &Zingales (1995), Chen et al. (1998) and Chen (2004) are some studies that explain capital structure patterns and give insights about capital structure. In 1958, Modigliani and Miller proposed that the value of a firm is independent of its capital structure in a perfect capital market. According to Modigliani and Miller (1958); in a perfect market there are no taxes or transaction costs and in such an environment, a firm's value strictly depends on the future cash flows. At this point, firms will be indifferent about financing themselves through internal or external funds. Modigliani Miller's perfect market definition also offers no bankruptcy costs, perfect contracting assumptions and complete and perfect market assumption.

The purpose of this study is to empirically test the determinants of the capital structure for the Turkish manufacturing firms between the years 2005 – 2014. Since 2005 is the adoption of IFRS for the Turkish listed firms and manufacturing industry includes huge number of companies in Borsa Istanbul, we would like to emphasize the period IFRS applied in Turkey. This study organized as follows. First of all factors that affect capital structure is hypothesized and panel regression model is applied. Rest of the paper presents empirical results and summarizes all findings and conclusion.

Variables and Hypothesis

Dependent Variable

According to the previous studies, there are many different alternative approaches to determine the dependent variable. For instance, Titman and Wessels (1988), Demirgüç et al. (1999), Booth et al. (2001) and De Jong et al. (2008) used the long term debt as dependent variable measured as the book value of long-term debt over market value of total assets which is calculated book value of total assets minus book value of equity plus market value of equity. Padron et al. (2005) used the market value based measure and defined the ratio of leverage as the ratio of total debt to the sum of total debt and the market value of equity. Some studies used more than one variable to measure gearing. For instance, Chen et al. (1998) used two measures of financial leverage, one is total debt divided by equity book value and the other is total debt divided by equity market value. In Turkey, Sarıoğlu et al. (2013), Okuyan and Taşçı (2010) also used more than one dependent variable. Ata and Ağ (2010) used the logarithmic value of Total Debt, Elitaş and Doğan (2015) measured the leverage as Total Debt/Total Equity. Our dependent variable is measured by the debt ratio which is defined as the ratio of total debt divided by the total assets of firm. Total debt equals to sum of long term and short term liabilities. Even though many studies about capital structure suggests only long term debt as gearing, short term debt was included as well, mainly because

Turkish firms use either small amount or no long term debt. It is also consistent with previous studies such as Eriotis et al. (2007), Rajan and Zingales (1995), Chen 2004, Abdioğlu and Deniz (2015), Burucu and Öndeş (2015)

Independent Variables

Firm Size

The relationship between firm size and leverage can be explained with some theories that argued by many different authors. According to Trade-off theory a firm's size has a positive impact on leverage. Large firms are expected to have a higher debt capacity. In larger firms, it is less likely to see higher bankruptcy risk and bankruptcy cost. Larger firms are tend to choose long term debt while small firms choose short term debt (Marsh 1982). According to Free cash flow theory which was offered by Jensen (1986), larger firms have more stable cash flow and firm size has a positive effect on the debt. Since larger firms have more bargaining power over creditors, they may take the advantage of economies of scale in issuing long term debt. Therefore the cost of issuing debt and equity is negatively related to firm size. (Huang and Song 2006). Titman and Wessel's study suggests that larger firms are more diversified and fail less often. On the other hand, there are some studies that explain the negative relationship. For instance Rajan and Zingales (1995) offers that since larger firms tend to provide more disclosure to outside than small firms, this situation may lead to prefer more equity financing relative to debt. Chen (2004) and Okuyan and Taşçı (2010) are other studies that provide the negative relationship between firm size and debt level.

There are several measurements to display firm size such as logarithm of Net Sales (Titman and Wessels 1988; Rajan and Zingales 1995; Sayılgan et al. 2006; Ata and Ağ 2010), logarithm of Total Assets (Padron 2005, Chen 2004; Daskalakis ve Psillaki, 2008), market value of the firm (Graham 2000) are some examples to firm size variable. In this study, we used the natural logarithm of total assets in real terms as a proxy for firm size.

H1. There is a positive relationship between firm size and leverage.

Profitability

There is an ambiguous view on the relationship between leverage and profitability. According to Pecking order theory, future projects of a firm should be financed through retained earnings, instead of external debt financing (Chen et al. 1998). Firms with more profitability have less debt in their capital structure. In addition, firms may lead to prefer internal financing because of information asymmetry between managers and outside investors. More profitable firms prefer not to raise external equity in order to avoid potential dilution of ownership as well (Deesomsak 2004).

In this study, we used return on assets as a proxy for profitability.

H2. There is a negative relationship between profitability and leverage.

Growth Opportunities

Previous empirical results are mixed about growth opportunities of firms related to leverage. According to Titman and Wessel's study (1988), they found a negative relationship between leverage and growth. Firms whose value come from intangible assets and have high potential growth do not want to choose debt financing as their revenue may not be available (Deesomsak 2004). In addition, Trade off theory offers that firms having future growth opportunities are less likely to prefer debt financing than firms

holding more tangible assets. Because intangible assets or future projects mainly cannot be served as collateral (Delcoure 2007). Myers 1977 also predicted that corporate borrowing is inversely related to growth opportunities. Cassar and Holmes' (2003) study revealed that there is a significant positive relationship between debt ratios and growth. Even though there are different opinions about the direction of relationship, many authors and theories support the view that there is an inverse relation between these variables.

Nevertheless, there are different measurements of growth opportunities such as the ratio of book to market equity, sales growth, R&D expenditures etc., we used asset growth as measurement of growth opportunities which is calculated by subtracting previous year assets from that of the current year and dividing the result by previous year assets.

H3. There is a negative relationship between growth opportunities and leverage.

Liquidity

Deesomsak et al. (2004) reported that there is a negative relationship between liquidity and debt ratios and offered firms with high liquidity prefer equity financing instead of debt financing. Pecking order theory brings forward the negative relationship that the companies with high liquidity are able to generate high cash inflows and use them for financing further investments (Hossain and Hossain 2015). The other point of view proposes that firms with higher liquidity ratios might support a relatively higher debt ratio due to greater ability to meet short term obligations when they fall due. This would imply a positive relationship between a firm's liquidity position and its debt ratio (Ozkan 2001).

We use the ratio of current assets to current liabilities as a proxy for the liquidity of the firm's assets.

H4. There is a negative relationship between liquidity and leverage.

Tangibility

A firm's tangibility has a positive impact on debt capacity because tangible assets would be the most widely accepted sources for bank borrowing and raising secured debts (Chen et al. 1998). According to trade-off theory, a company with more tangible assets would have a greater ability to attract more debt because tangible assets may be collateralized in the event of bankruptcy (Alipour et al. 2015). If firms are unable to provide collaterals with their tangible assets, they may pay higher interest or they may prefer equity financing. Tangible assets as debt collateral usually decreases lenders' risk (Delcoure 2007). Titman and Wessels (1988), Rajan and Zingales (1995), and Chen (2004) also reported significant positive relations between asset tangibility and a firm's debt structure. We measured the tangibility as the ratio of tangible assets to total assets.

H5. There is a positive relationship between tangibility and leverage.

Non-debt Tax Shield

Trade-off theory predicts that using debt financing is superior to equity financing because of motivation of saving corporate tax (Deesomsak et al. 2004). On the other hand, interest tax shields are not the only way to mitigate tax burden (Sayılgan et al. 2006). Depreciation can be used as a non-debt tax shield to reduce corporate tax. Even though many studies found an inverse relation between debt and non-debt tax shield, Bradley et al. (1984) offered a significant positive relationship in firms that invest heavily in tangible assets and generate high amount of depreciation. We used the ratio of annual depreciation and

deflation to total assets as a proxy of non-debt tax shield such as Titman and Wessels (1988), Deesomsak et al. (2004), Ozkan (2001).

H6. There is a positive relationship between non-debt tax shield and leverage.

Earnings Volatility (Risk)

Financial distress plays a significant role in capital structure decision. Trade off theory explains that firms with higher debt or high possibility to fail should not be highly leveraged (Alipour et al. 2015). According to Jensen (1986), pecking order theory also suggests the negative relationship between leverage and earnings volatility. Higher volatility of earnings increases the probability of financial risk and these firms will face the difficulties in debt financing.

Several measures of volatility are used in empirical studies, such as the standard deviation of the return on sales (Booth et al., 2001, Huang and Song 2006). Chen et al. (1998) used the absolute value of the first difference of percentage change of operating income as the proxy of earnings volatility. Deesomsak et al. (2004) used the absolute difference between the annual percentage change in earnings before interest and taxes. We measured the earnings volatility with the change in operating income.

H7. There is a negative relationship between earnings volatility and leverage

Research Methodology and Sample Selection

Sample Selection

In this paper, we investigate the determinants of capital structure for the firms listed in Borsa Istanbul during the period 2005 - 2014. The sample of this study includes 131 Turkish manufacturing firms listed on Borsa Istanbul. All the companies included in the sample fulfill the following two criteria; they were all listed in the market in 2005 and none of them was expelled during the period 2005-2014. Therefore, some firms were eliminated from the study. Our analysis consists of a total 1290 observations from the financial statements of firms using Thomson Reuters Eikon database. Since the financial statements of banking sector and insurance companies are differ in many ways, non – financial companies, especially manufacturing companies were chosen as our sample. It is also consistent with the previous studies such as Rajan and Zingales (1995), Sayılgan et al. (2006), Padron et al. (2005)

Table 1. Sample Firms

Firms listed on BIST manufacturing sector	192
Firms not listed on BIST manufacturing sector in 2005	(43)
Firms have missing data	(17)
Total sample firms	131
Total firm-year observations	1290

Methodology

Panel data analysis offers a combination of regression and time series data type. It includes both cross-sectional and time series dimensions for each individual. This makes it possible to study a dynamic aspect of problem (Frees, 2004).

A panel data regression model with k variables can be shown;

$$Yit = \beta 1it + \beta 2itX2it + \beta 3itX3it + \cdots + \beta nitXnit + uit \quad (1)$$

In the model I:1,2,….,N shows cross section and T= 1,2,….,N shows time periods. Also u_{it} is assumed to be zero mean and constant variance. There are more parameters predicted than observations. Therefore model cannot be predicted in this form and it should be reconstructed. In order to do that, there has to be some assumptions made to have the models known as fixed effects and random effects. Firstly, we assume all regression coefficients are equal for common units, then model can be shown;

$$Yit = \beta 1 + \beta 2X2it + \beta 3X3it + \cdots + \beta nXnit + uit \quad (2)$$

β_1 is a common intercept for all units and β2, ... , βk parameters are common marginal effects of each explanatory variables. In other words β parameters aren't differ between units and times. This model is also known as fixed effects model.

Random effects model is the different form of fixed effects model in terms of intercept. Random effects intercept term is modelled as $\beta 1 = \overline{\beta}1 + \mu i$ and the model is shown as

$$Yit = (\overline{\beta}1 + \mu i) + \beta 2X2it + \beta 3X3it + \cdots + \beta nXnit + uit \quad (3)$$

$$Yit = \overline{\beta}1 + \sum_{n=2}^{N} \beta\, nXnit + (uit + \mu i) \quad (4)$$

In order to decide between fixed effects model and random effects model, Hausman specification test is used. If the Hausman test does not indicate a significant difference ($p > 0.05$), then random effects model is preferred and vice versa.

Determinants of Capital Structure Model

$$Leverageit = \beta 1 + \beta 2Sizeit + \beta 3Growthit + \beta 4Tangibilityit + \beta 5NonDebtit + \beta 6Volatilityit + \beta 7Liquidityit + uit$$

Where;

Table 2. Variable Definition

VARIABLE	DEFINITION	EXPECTED SIGN
Firm Size	Log Of Total Assets	+
Profitability	Return On Assets	-
Growth	Percentage Change In Total Assets	-
Liquidity	Current Ratio	-
Tangibility	Tangible Assets / Total Assets	+
Non-Debt Tax Shield	Depreciation + Deflation / Total Assets	+
Earnings Volatility	Percentage Change In Operating Income	-

The sample contains 131 Turkish Manufacturing firms listed in Borsa Istanbul between the years 2005 – 2014. Descriptive statistics include the mean, the median, the standard deviation and the maximum, minimum values for the 10 years in Table 1. Each explanatory and dependent variable is given in the table above.

Table 3. Descriptive Statistics

Panel A

DESCRIPTIVE ANALYSIS				
	Leverage	**Tangibility**	**Firm Size**	**Profitability**
Mean	0,45	1,02	8,38	3,92
Median	0,43	0,45	8,37	3,84
Maximum	1,61	1,44	1,03	8,45
Minimum	0,02	-8,26	6,54	-5,18
Std. Deviation	0,22	5,25	0,67	1,09
Observations	1290	1290	1290	1290

Panel B

DESCRIPTIVE ANALYSIS				
	Non-Debt Tax	**Liquidity**	**Earnings Volatility**	**Growth**
Mean	0,06	2,39	5,59	1,15
Median	0,03	1,67	1,32	7,82
Maximum	6,44	2,57	9,49	4,33
Minimum	0,00	0,10	-1,47	-6,49
Std. Deviation	0,23	2,31	6,97	2,73
Observations	1290	1290	1290	1290

In order to determine the absence of multicollinearity problems, the Pearson's correlation coefficients between explanatory variables were tested. Gujarati (2003) suggests that multicollinearity is a serious problem only if the correlation coefficient between explanatory variables is more than 0.8. Since there is no result above than this limit in correlation matrix table, multicollinearity cannot be considered as an issue and can be ignored. Yet, according to the correlation matrix given in Table 4, there is relatively high correlation among some of the variables. For instance, highly negative relationship between leverage and liquidity and between leverage and profitability is noted -0,62 and -0,47 respectively. In addition, there is also positive relatively high correlation between tangibility and growth and liquidity and profitability like in many studies.

Table 4. Correlation matrix

	LEV.	**TANG.**	**SIZE**	**PROF.**	**NDEBT**	**LIQ.**	**VOL.**	**GRW**
Leverage	1,00	-	-	-	-	-	-	-
Tangibility	0,01	1,00	-	-	-	-	-	-
Firm Size	0,05	0,01	1,00	-	-	-	-	-
Profitability	-0,47	0,08	0,27	1,00	-	-	-	-
Non-Debt	0,01	0,03	-0,10	-0,03	1,00	-	-	-
Liquidity	-0,62	0,00	-0,13	0,42	-0,01	1,00	-	-
E. Volatility	-0,03	0,01	0,05	0,19	-0,02	-0,01	1,00	-
Growth	0,11	0,48	0,14	0,20	-0,02	-0,03	0,04	1,00

In order to provide the stationarity of all variables, unit root tests were run.

Table 5. Unit Root Tests Results

Panel A

LEVIN, LIN & CHU UNIT ROOT TEST				
	Statistic	Probability	Cross-Sections	Obs.
Leverage	-131.176	0.0000	131	1042
Tangibility	-265.719	0.0000	131	1039
Firm Size	-739.122	0.0000	131	1042
Profitability	-186.415	0.0000	131	1042
Non-Debt	229.979	10.000	130	1033
Liquidity	-143.209	0.0000	131	1042
E. Volatility	-197.083	0.0000	131	1042
Growth	-276.495	0.0000	131	1042
**Unit root (assumes common unit root process)				

Panel B

ADF - FISHER CHI-SQUARE UNIT ROOT TEST				
	Statistic	Probability	Cross Sections	Obs.
Leverage	318.760	0.0094	131	1042
Tangibility	556.654	0.0000	131	1039
Firm Size	215.330	0.9840	131	1042
Profitability	428.745	0.0000	131	1042
Non-Debt	404.677	0.0000	130	1033
Liquidity	361.097	0.0000	131	1042
E. Volatility	533.387	0.0000	131	1042
Growth	539.291	0.0000	131	1042
**Unit root (assumes individual unit root process)				

The empirical panel estimation results obtained from OLS model, Fixed Effects Model and Random Effects Model is given in Table 3.

Table 6. OLS, Fixed and Random Effects Models Comparison

	ORDINARY LEAST SQUARE		**RANDOM EFFECTS MODEL**		**FIXED EFFECTS MODEL**	
Dependent Variable: Total Debt / Total Assets	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
Tangibility	-0,0020	0,0392**	-0,0020	0,0010***	-0,0018	***0,0030******
Firm Size	0,0174	0,0161**	0,0918	0,0000***	0,1812	***0,0000******
Profitability	-0,0064	0,0000***	-0,0048	0,0000***	-0,0045	***0,0000******
Non-debt Tax	0,0080	0,6783	0,0204	0,0817*	0,0297	***0,0120****
Liquidity	-0,0448	0,0000***	-0,0235	0,0000***	-0,0190	***0,0000******
Earnings Volatility	0,0000	0,5237	0,0000	0,3079	0,0000	0,3169
Growth	0,0014	0,0000***	0,0008	0,0000***	0,0006	***0,0000******
Constant	0,4184	0,0000	-0,2553	0,0103	-1,0164	0,0000
R- Squared	**0,4689**		**0,3153**		**0,8397**	
Adjusted R- Squared	0,4660		0,3116		0,8208	
S,E, Of Regression	0,1590		0,0962		0,0921	
Sum Square Resid.	3,2394		1,1870		9,7771	
F- Statistics	1,6167		8,4349		4,4407	
Prob. (F-Statistics)	0,0000		0,0000		0,0000	
Durbin Watson Stat.	0,6615		1,0716		1,2065	

In this study, we present all panel regression estimators in Table 4. According to the Hausman test that suggests which model should be used to estimate, fixed effects model is superior to random effects model with the results.

Table 7. Hausman Test

Hausman Test			
	Chi-Sq. Statistic	Chi-Sq. Degree of Freedom	Probability
Cross-section random	124.763.456	7	0.0000

Research Findings

The results given in Table 3 shows that except earnings volatility, all variables are significant and the explanation power of the model is extremely sufficient with the value %84. Non – Debt Tax Shield is the only variable which is significant at %5 and the rest of the variables are all significant at %1. *Firm size* shown as logarithmic value of Total Assets has positive and %1 significant effect on leverage that is consistent with existing literature and our expectation. The other studies such as Rajan and Zingales (1995), Padron (2005), Sayılgan et al. (2006) found the exact positive and significant relationship, However, Marsh (1982), Titman and Wessels (1988) found the negative one. As it implied in trade off theory, larger firms are tend to be highly geared and they are expected to use more debt financing. Since larger firms are able to disclose more information, they will have more sources to reach various debt financing easily as well. *Profitability* displayed as Return on Assets has negative and %1 significant impact on leverage that is suitable to our hypothesis and H2 is accepted. Rajan and Zingales (1995), Gaud (2005), Sayılgan et al. (2006) are some other studies that results show similarity. According to pecking order theory, more profitable firms will finance themselves in favor of equity financing. Having the potential of being profitable may impede the executives to choose debt financing under the light of agency theory. *Growth opportunities* which was described as change in total assets has positive and %1 significant effect on leverage that is in compliance with existing studies but not with the expectation. Sayılgan et al. (2006), Chen (2003), Cassar and Holmes (2003) studies revealed that there is a significant positive relationship between debt ratios and growth. Current Assets / Current Liabilities were used to measure the *liquidity* of a firm and the ratio is %1 significant and negative impact on leverage as expected. Pecking order theory also supports the view that more liquid firms will receive more cash inflows and this will be used for financing future investments. *Tangibility* which is denoted as Tangible Assets / Total Assets has negative and %1 significant impact on leverage that is contrary to our hypothesis. Trade off theory suggests that tangible assets are most widely accepted sources for bank borrowing and raising secured debts. This result is not consistent with many previous studied such as Marsh (1982), Rajan and Zingales (1995), Gaud (2005) etc. In addition, Sayılgan et al. (2006) and Alipour et al. (2015) are some studies found the negative significant relationship. This situation is related with Turkish firms' debt financing choice. Turkish firms are eager to finance themselves through short term debt financing and excessive use of short term debt financing may explain the negative relationship between leverage and tangibility. *Non-debt tax shield* shown as the ratio of annual depreciation and deflation to total assets such as in Titman and Wessels (1988), Deesomsak et al. (2004), Ozkan (2001) studies has positive and %5 significant. Bradley et al. (1984) also found the positive relationship as well. *Earnings volatility* identifies the financial distress that displayed as change in operating income is the only variable insignificant according to panel regression results. Since the measurement of earnings volatility are differ and several measures of volatility are used in empirical studies, such as the standard deviation of the return on sales (Booth et al., 2001, Huang and Song 2006) or the absolute difference

between the annual percentage change in earnings before interest and taxes Deesomsak et al. (2004), the results are not consistent with the existing literature.

Table 8. Hypothesis Results

VARIABLES	DEFINITION	EXPECTED SIGN	RESULTS	HYPOTHESIS
Firm Size	Log Of Total Assets	+	+	**H1 is accepted**
Profitability	Return On Assets	-	-	**H2 is accepted**
Growth	Percentage Change In Total Assets	-	+	**H3 is rejected**
Liquidity	Current Ratio	-	-	**H4 is accepted**
Tangibility	Tangible Assets / Total Assets	+	-	**H5 is rejected**
Non-Debt Tax Shield	Depreciation + Deflation / Total Assets	+	+	**H6 is accepted**
Earnings Volatility	Percentage Change In Operating Income	-	**Not significant**	**H7 is rejected**

Conclusion:

Capital Structure and its determinants are an ongoing question mark for more than half century and magic combination of debt and equity for a firm is still courted debate. Even though many studies take place about capital structure and firm characteristics in Turkey, this study is differ from the previous ones for the period and the firms covered. In addition, we would like to emphasize what factors have essential impact on gearing and what variables can be eliminated while determining the debt financing level. Our analysis includes 131 Turkish manufacturing firms listed in Borsa Istanbul for the period 2005 – 2014. Empirical results indicated that six variables are significant except for earnings volatility. Firm size, Growth in Assets and Tangibility are positively related while rest of the variables have a negative association.

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